Association of Depression Symptoms with Receipt of Healthcare Provider Advice on Physical Activity among US Adults

Introduction

Depression is estimated to affect more than 300 million people worldwide (World Health Organization, 2017, 2018). In the US, approximately 8.1% of the population have major depression, with prevalence around twice as high in women (10.4%) than men (5.5%), a pattern observed in all age groups (Brody, Pratt, & Hughes, 2018). Depressive disorders are among the leading causes of the Global Disease Burden and years lived with disability, with more than 80% of adults with depression reporting difficulties at work and home and with social activities (Brody et al., 2018; Ferrari et al., 2013; Murray et al., 2013).

Given its high prevalence and substantial individual and societal burden, there is an urgent need for strategies to reduce the onset and burden of depression. Antidepressants are the most commonly prescribed treatment of depression in primary care (Olfson, Blanco, & Marcus, 2016). However, they often increase cardiovascular risk, especially in patients with existing cardiovascular risk factors (Biffi, Scotti, & Corrao, 2017; Jolly & Langman, 2009). Aside from medication use, various recommendations, including those of the US Preventive Services Task Force, suggest the use of psychotherapy and highlight the need for health behaviour modification (National Institute for Health and Care Excellence, 2018; Siu et al., 2016).

Physical activity (PA) may be a particularly important behaviour to target. PA has been demonstrated to effectively reduce depressive symptoms in those with depression, potentially due to its influence on immunological factors that moderate mood or through promoting cortisol reduction, and endorphins and monoamines secretion (Duclos,

Gouarne, & Bonnemaison, 2003; Hamer, Endrighi, & Poole, 2012; F. B. Schuch et al., 2016). Recent meta-analyses have indicated that PA both protects against the onset of depressive symptoms and is effective in improving experienced symptoms and decreasing the reoccurrence of depressive symptoms later in life (Cooney et al., 2013; Mammen & Faulkner, 2013; F. B. Schuch et al., 2016). In addition, exercise (a domain of PA) appears to be as effective as, if not more than, psychological and pharmacological therapies (Cooney et al., 2013; Mammen & Faulkner, 2013). Perhaps more importantly, qualitative research into individual experiences of adults reporting depressive symptoms shows that PA is associated with improved sense of purpose and quality of life, and fosters the development of social networks and relationships (Blake, 2012).

Despite these demonstrated benefits of PA, people with depression are typically less likely to meet the recommended levels of PA and tend to have more sedentary lifestyles than their non-depressed counterparts (Goodwin, 2003; Hallgren et al., 2017; F. Schuch et al., 2017). Furthermore, people with depression are more likely to quit PA regimes when faced with barriers, and often require more support and encouragement (Blumenthal, Smith, & Hoffman, 2012; DiMatteo, Lepper, & Croghan, 2000; F. Schuch et al., 2017). Importantly, studies show that even brief advice on the benefits of PA appear to be effective (Adams, Remick, Davis, Vazirian, & Khan, 2015; Blumenthal et al., 2012; Janney et al., 2017; Ranjbar et al., 2015; Richardson et al., 2005), supported by increased levels of PA observed following brief advice from their healthcare providers (Chalder et al., 2012). The important role of healthcare providers in motivating and providing advice on PA (particularly structured exercise) has been underlined in various guidelines and studies (American Psychiatric Association, 2010; Callaghan, Khalil, Morres, & Carter, 2011; National Institute for Health and Care

Excellence, 2018). However, the extent to which healthcare providers in the US advise exercise to individuals with depression remains unclear.

Therefore, the aim of this study was to use recent nationally representative data from the National Health and Nutrition Examination Survey (NHANES) to examine the prevalence of provision of PA/exercise advice by healthcare providers to US adults with depressive symptoms. Because adults living with existing chronic diseases might be more likely to receive such advice, we restricted our study sample to adults free from common chronic diseases

MATERIALS AND METHODS

Study Population

NHANES was designed to provide cross-sectional estimates of the prevalence of health, nutrition, and potential risk factors among the civilian non-institutionalized US population using a nationally representative complex, stratified, multistage, probability clustered sample (Centers for Disease Control and Prevention, 2014). We extracted data on sociodemographic characteristics, body measurements, medical conditions, access to health care and lifestyle characteristics in the latest three waves from 2011-2012 to 2015-2016, and excluded those who were living with chronic diseases, physical function limitation (walking for a quarter mile or walking up ten steps difficulty for adults), or pregnant.

Depressive symptoms

Depressive symptoms were assessed using the Patient Health Questionnaire (PHQ-9), a validated 9-item depression screener that asks about the frequency of symptoms

of depression over the past 2 weeks (Kroenke, Spitzer, & Williams, 2001). Each item was scored on a 0-3 scale, with a total score ranging from 0 to 27. PHQ-9 scores categorised depression severity as “none or minimal” (0-4), “mild” (5-9), “moderate” (10-14), “moderately severe” (15-19), and “severe” (20-27). For current analyses, participants who scored 10 or more were combined into one group as *clinically relevant* depression; such diagnosis has shown a sensitivity of 88 % and a specificity of 88 % for major depression (Kroenke et al., 2001; Manea, Gilbody, & McMillan, 2012).

Healthcare providers’ advice on physical activity/exercise

Participants were asked “To lower your risk of certain disease, during the past 12 months have you ever been told by a doctor or health professional to: increase your physical activity or exercise?” Response options were yes (received advice) and no (did not receive advice).

Chronic diseases

Prevalent chronic diseases were used for exclusion: high blood pressure, high blood cholesterol level, arthritis, coronary heart disease, type 2 diabetes mellitus (T2DM) and cancer. Participants with high blood pressure and cholesterol were identified using both self-reported and laboratory examinations. The details of blood pressure and laboratory cholesterol measurements are described elsewhere (Centers for Disease Control and Prevention, 2011; Zipf et al., 2013). High blood pressure was determined if the participant reported having been told they had high blood pressure or hypertension by a health professional, or the mean of at least 3 blood pressure measurements was 140 mm Hg or higher for systolic, or 90 mm Hg or higher for diastolic (Muntner et al., 2018). High blood cholesterol was determined by self-reported

having been told they had high cholesterol by health professional, or if their measured total cholesterol level was 6.2 mmol/L (240 mg/DL) or higher (Gregg et al., 2005). Arthritis was determined by self-reporting having been told they had arthritis by a health professional (Liu, Eaton, Driban, McAlindon, & Lapane, 2016). Coronary heart disease was defined based on participants' self-reported conditions of diagnosed congestive heart failure, angina, heart attack, or coronary heart disease. Structured interview questions on chest pain were further used to classify angina based on existing Rose angina criteria (Rose, McCartney, & Reid, 1977). Diabetes was determined by self-reporting having been told they had diabetes by a health professional or reporting taking insulin. Cancer diagnosis was determined by self-reporting having been told they had cancer by a health professional.

Weight status

Weight and height were measured during a physical examination following standard procedures. Body mass index (BMI) was calculated as weight in kg/(height in meters)^2 and categorized into: underweight (<18.5 kg/m^2), normal weight (18.5– <25 kg/m^2), overweight (25.0– <30 kg/m^2), and obesity (≥30 kg/m^2) based on the standard classification (World Health Organization, 2019). For analytic purposes, we exclude those who were underweight due to potential underlying health conditions.

Covariates

Self-reported socio-demographic characteristics included age, gender, race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, and others), annual household income ($25,000 or less, $25,000 to $74,999, and $75,000 or above), insurance (uninsured, insured with public insurance, and insured with private insurance), access to routine healthcare (Yes/no to "Is there a place that you usually

go when you are sick or you need advice about your health?") and education (less than high school, high school, and above high school). Lifestyle characteristics included leisure time physical activity and smoking status. Participants reported the number of days and minutes spent in moderate recreational and vigorous recreational activities in a typical week. We summarized the total number of minutes for both activities and classified participants as inactive (zero moderate-to-vigorous physical activity), and active (any moderate-to-vigorous physical activity) based on the physical activity guideline (Piercy et al., 2018). Smoking status was classified into: never smokers (did not smoke 100 cigarettes and do not smoke now), former smokers (smoked 100 cigarettes in life and do not smoke now), and current smokers (smoked 100 cigarettes in life and smoke now).

Analysis

All statistical analyses were performed using STATA version 14.0 (STATA Corp., College Station, Texas, USA). Survey analysis procedures were used to account for the sample weights, stratification, and clustering of the complex sampling design to ensure nationally representative estimates (Curtin et al., 2012). Given the documented association between weight status and depression, we calculated the prevalence (weighted proportion) of participants receiving exercise advice in relation to severity of the depressive symptoms (none or minimal, mild, moderate-severe) in overall and in each BMI category. We further examined trends in the likelihood of receiving exercise advice by the severity of depressive symptoms modelling as a continuous variable. In addition, multivariable adjusted logistic regression models were used to estimate the odds of reporting receipt of exercise advice in each depressive symptoms level to identify correlates of receiving exercise advice. Multivariable adjustments include age (continuous), gender, BMI category, race/ethnicity, household income, health

insurance status, access to routine health care, leisure time physical activity, education level, and smoking status. All statistical significance was set at $P<0.05$. P-values were not adjusted for multiple tests and should be interpreted explanatorily only.

RESULTS

Overall, data on 4971 (weighted n= 75,653,336) adults were included in the analysis. Table 1 presents the unweighted sample size of US adults free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease, and cancer overall and by gender, BMI, race/ethnicity and smoking status. Among those adults free of chronic conditions, 81.8% had no or minimal depressive symptoms, while 12.6% had mild symptoms and 5.6% had moderate-severe symptoms.

Overall, 17.9% of adults with no or minimal depressive symptoms, 26.9% of those with mild symptoms, and 29.5% of those with moderate-severe symptoms reported having received advice to exercise from their healthcare provider. In the BMI category-specific analysis, among those with normal weight BMI (<25 kg/m^2), adults with moderate-severe depressive symptoms (23.4%, 95% CI: 15.9% to 33.0%) were more likely to report having received exercise advice from their healthcare provider than those with no or minimal depressive symptoms (8.1%, 95% CI: 6.2% to 10.4%) (P for trend <.001) (Table 2). A similar trend was observed for adults with BMI 25 - <30.0 kg/m^2 (P for trend = 0.018) and BMI ≥ 30 kg/m^2 (P for trend < .001) (Table 2).

The higher likelihood of reporting having received advice to exercise with graded depressive symptoms persisted after multivariable adjustment (Table 3). Relative to those with no or minimal depressive symptoms, odds of reporting having received

advice were 70% higher among participants with mild symptoms (OR=1.7, 95% CI: 1.3 to 2.3) and 70% higher among those with moderate-severe symptoms (OR=1.7, 95% CI: 1.0 to 2.8). Other variables independently associated with reporting having received exercise advice from a healthcare provider were women, higher BMI, Hispanic or Asian ethnicity, having private insurance, have access to routine health care, and higher than high school education (Table 3).

Discussion

In a large contemporary nationally representative sample of US adults, 12.6% reported mild depressive symptoms and a further 5.6% reported moderate-severe depressive symptoms. Of these individuals, less than one in three reported having received exercise advice from a healthcare provider. When the sample was analysed by BMI category, we observed that adults in the normal BMI category with moderate to severe depressive symptoms were more likely to receive exercise advice than those with no or minimal symptoms, with a similar trend seen in those with overweight and obesity. After multivariable adjustment, receipt of exercise advice was more frequently reported by adults with mild and moderate-severe depressive symptoms, and by women, those with overweight or obesity, Hispanic or Asian ethnicity, health insurance, access to routine health care, and a higher than high school level education.

Studies indicate that patients with depressive symptoms typically have lower levels of PA and a more sedentary lifestyle, which puts them at increased risk for obesity (Goodwin, 2003; Hallgren et al., 2017; F. Schuch et al., 2017). In our sample, obese individuals comprised 37.9%% of the study population with moderate-severe depressive symptoms, in contrast to 27.8% obese among those with no or minimal

depressive symptoms. Our results also indicate that adults with overweight and obesity were 2.2 and 6.1 times more likely to receive advice on exercise. It is plausible to hypothesize that here the healthcare provider´s motivation was influenced by the patients weight status rather than severity of depression symptoms, as was observed in a previous study on the association of exercise advice and weight status among US adults living with chronic diseases (Grabovac et al., 2018). However, advice based on overweight and obesity, rather than depression, is still beneficial as studies indicated that obesity increases the risk of depression (Chu et al., 2019). This association was more pronounced among American samples when compared to European one (Luppino et al., 2010), however it's worthwhile noting that the relationship between overweight/obesity and depression is not unidirectional (Chu et al., 2019; Luppino et al., 2010). Importantly, our analysis showed that normal weight patients with mild and moderate-severe depression symptoms only receive advice on exercise in 13% and 23% of cases, respectively. This suggests that healthcare providers are missing a vital opportunity to engage their patients in additional therapeutic modalities. Supporting patients with depression to exercise is an important therapeutic modality, supported by numerous studies (Cooney et al., 2013; Mammen & Faulkner, 2013; F. B. Schuch et al., 2016) and supported by the American Psychiatric Association (American Psychiatric Association, 2010). Literature suggests that both aerobic and resistance exercise have a positive effects on depressive symptoms, with evidence showing larger effects for aerobic exercise when compared to mixed (aerobic and resistance) exercise (F. B. Schuch et al., 2016). However, a recent meta-analysis of the effects of resistance exercise also reported on overall positive effects in people reporting depressive symptoms, while noting the need for more studies with better described interventions and patient groups (Gordon et al., 2018).

We speculate that reasons for low prevalence of provision of advice may include general disillusionment of healthcare providers concerning their patients' ability or willingness to meet PA guidelines, which has been shown to be a barrier in providing such advice (Jackson, Doescher, Saver, & Hart, 2005). Furthermore, some healthcare providers report feeling ill equipped to dispense advice on PA and often have reservations due to their subjective judgements on their patients' motivation (Din, Moore, Murphy, Wilkinson, & Williams, 2015), while others provide unclear advice without referring patients or consulting exercise specialists (Ranjbar et al., 2015). This may be further exacerbated as some studies indicated that depression is a risk factor for treatment non-compliance (DiMatteo et al., 2000). Including a multidisciplinary team comprising of exercise scientists along with health care providers and mental health specialists could lead to better defined, more efficient and safer exercise programs (Pescatello, Arena, Riebe, & Thompson, 2014; Ranjbar et al., 2015). Some also fear that promoting PA might potentially exacerbate the already existing socioeconomic inequalities highly prevalent among people with depression (Din et al., 2015; Fryers, Melzer, Jenkins, & Brugha, 2005; Lorant et al., 2003). However, a UK based study demonstrated that depressed patients enrolled in a clinical trial on PA intervention showed good compliance (Chalder et al., 2012). In fact, qualitative research has revealed that patients with depressive symptoms generally see PA as an acceptable form of treatment that helps to enhance their mood, yet lack of motivation was a considerable barrier (Searle et al., 2011).

Our results show that exercise advice is more commonly reported among adults with mild and moderate-severe depression symptoms, women, those with overweight and obesity, with Hispanic or Asian ethnic background, insured, with access to routine healthcare, and with higher level of education compared to their counterparts.

Furthermore, the associated variables in our model have been found to affect help seeking behaviour among individuals with depression and lead to further social inequalities in health (Magaard, Seeralan, Schulz, & Brutt, 2017). The observed pattern suggests that in order to prevent further disparities, community-based exercise interventions for people with depression should be freely offered and accessible to the widest variety of people, especially in light of the multidimensional nature of inequalities in people with mental health problems (Hoebel, Maske, Zeeb, & Lampert, 2017).

With the rising incidence of depression and the associated health burden in the US population, timely response from policy and decision makers within the healthcare system is needed. Management of mental health issues, as complex conditions affecting various health and social aspects of the patients and their surroundings require strategies aimed at various levels: individual, community, environment and policy (Jenkins, 2003). These strategies should be developed in cooperation with both patient advocacy groups and healthcare providers and policy makers in order to ensure best possible outcomes.

Strengths of this study include a use of a well-defined nationally representative sample and use of established methods of determining symptoms of depression. However, considering the important social and cultural aspects of overweight/obesity as well as depression, the results could prohibit generalizations on samples outside the USA. Furthermore, causal relationships are not possible given the cross-sectional analysis.

In conclusion, less than one in three adults in the US experiencing symptoms of depression report having received PA/exercise advice from a healthcare provider. Given the importance of PA in this patient group, such advice should be widely implemented in order to reduce the burden associated with depression (American

Psychiatric Association, 2010; Blumenthal et al., 2012; Mammen & Faulkner, 2013; National Institute for Health and Care Excellence, 2018; F. B. Schuch et al., 2016). Our results identify an important window of opportunity for implementation of brief advice on PA/exercise for patients with depressive symptoms, as well as highlighting the need for PA/exercise advice to be more accessible for the uninsured population without routine healthcare access.

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Table 1. Sample Size for US Adults Free of Chronic Conditions, NHANES 2011-2016

	Free of chronic conditions[a]	
	unweighted n	weighted %
Overall	4971	
Gender		
Men	2758	50.6
Women	2943	49.4
BMI		
< 25 kg/m2	2371	41.2
25 - 29.9 kg/m2	1735	30.5
≥ 30 kg/m2	1595	28.3
Race/ethnicity		
Non-Hispanic white	1909	61.5
Non-Hispanic black	1181	10.9
Hispanic	1474	18.3
Asian	945	6.3
Other	192	2.9
Health insurance status		
Uninsured	1698	24.3
Non-private insurance	1034	14.3
Private insurance	2965	61.4
Physical activity		
Inactive	2405	36.2
Active	3296	63.8
Smoking status		
Never	3752	64.1
Former	791	16.3
Current	1158	19.7
Depressive symptoms		
None or minimum (0-4)	4048	81.8
Mild (5-9)	651	12.6
Moderate-severe (10-27)	272	5.6
Access to a routine place for healthcare		
No	1518	24.9
Yes	4183	75.1

[a] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease, and cancer

Table 2. Weighted Prevalence of Receipt of Exercise Advice from a Healthcare Provider according to Weight Status and Depressive Symptoms in the US population, NHANES 2011-2016[ab]

	All BMI			BMI < 25 kg/m^2			BMI 25 - <30 kg/m^2			BMI ≥ 30 kg/m^2		
Weighted Prevalence %	19.7	(18.1 to	21.5)	9.7	(8.1 to	11.6)	17.9	(15.4 to	20.6)	36.7	(33.4 to	40.0)
	By depressive symptom severity											
None or minimum (0-4)	17.9	(15.8 to	20.2)	8.1	(6.2 to	10.4)	16.0	(13.1 to	19.4)	34.6	(30.4 to	39.1)
Mild (5-9)	26.9	(22.8 to	31.5)	13.5	(8.7 to	20.4)	28.2	(20.6 to	37.4)	44.4	(35.8 to	53.2)
Moderate-severe (10-27)	29.5	(22.8 to	37.3)	23.4	(15.9 to	33.0)	10.9	(5.2 to	21.4)	46.8	(33.6 to	60.5)
P for trend		<.001			<.001			0.018			.009	

[a] All estimates were weighted to be nationally representative.

[b] P values for trend were calculated using logistic regression models modelling Patient Health Questionnaire (PHQ-9) score as a continuous variable.

[c] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease and cancer

Table 3. Weighted Multivariable Adjusted Logistic Regression Models of Receipt of Healthcare Providers' Advice on Physical Activity/Exercise among US Adults, NHANES 2011-2016[a]

	Odds Ratio (95 % CI)		
Depressive symptoms			
None or minimal (0-4)	Reference		
Mild (5-9)	1.7	(1.3 to	2.3)
Moderate-severe (10-27)	1.7	(1.0 to	2.8)
Age (continuous)	1.0	(1.0 to	1.0)
Gender			
Men	Reference		
Women	1.8	(1.5 to	2.2)
BMI			
< 25 kg/m2	Reference		
25 - <30 kg/m2	2.2	(1.7 to	2.9)
≥ 30 kg/m2	6.1	(4.6 to	8.1)
Race/ethnicity			
Non-Hispanic white	Reference		
Non-Hispanic black	1.0	(0.8 to	1.3)
Hispanic	1.4	(1.1 to	1.9)
Asian	1.6	(1.2 to	2.1)
Others	1.5	(0.9 to	2.3)
Annual household income			
<$25,000	Reference		
$25,000-<$75,000	1.1	(0.9 to	1.5)
≥$75,000	1.2	(0.9 to	1.6)
Health insurance status			
Uninsured	Reference		
Non-private insurance	1.3	(0.9 to	1.9)
Private insurance	1.4	(1.0 to	2.0)
Access to a routine place for healthcare			
No	Reference		
Yes	1.8	(1.3 to	2.6)
Leisure time physical activity			
Inactive	Reference		
Active	0.9	(0.7 to	1.2)
Education			
<High school	Reference		
High school	1.2	(0.9 to	1.7)
>High school	1.8	(1.3 to	2.5)
Smoking status			
Never	Reference		
Former	1.2	(0.8 to	1.8)
Current	1.1	(0.8 to	1.5)

[a] All estimates were weighted to be nationally representative.

[b] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease and cancer.